

MARS ANALOG HABITAT SURVEYS & THE SEARCH FOR MICROBIAL LIFE REMOTELY WITH AN AUTONOMOUS ASTROBIOLOGY ROVER

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During the 2004 'Life in the Atacama Desert' field experiment, habitats favorable to the survival of microbial life in hyperarid deserts were successfully identified, located and sampled, and the biosignatures of extant life forms detected remotely by an autonomous rover. The search for these habitats forms the nexus for integration of disparate disciplines and rover capabilities in an astrobiology mission: spectroscopy for mineralogy; fluorescence imaging for chlorophyll, DNA and protein detection; and visible imagery for macro- and micro-scale ecology and geology. Twenty-four locales were surveyed during a 6 km science traverse at 'wet' site B and a 23.5 km traverse at 'dry' site C. Distinct microhabitat types surveyed included: (1) clay minerals, sulfates and unaltered parent rock comprising desert pavement surface soils and rocks, (2) dark, mafic rocks; (3) translucent rocks and salts (sulfates, including gypsum), and (4) large boulders in runoff channels. Eukaryotic lichens were detected by fluorescence on (1) at site B, which were confirmed by ground truth. Photosynthetic and non-photosynthetic endolithic bacteria surviving in the exposed cracks of (2) and (3), and possible halophilic bacteria on (3), were also likely detected, but confirmation awaits ground truth. At hyperarid site C, less microbial diversity was observed, with no eukaryotic life forms detected. However, endolithic bacteria in mafic rocks and halophilic bacteria in sulfate salts, were likely identified. Desert varnish was observed at both sites. Potential interactions by salts with fluorescent dyes and/or mineral fluorescence may also explain certain results, but further ground truth and laboratory experiments are necessary.